

Fox proteins are modular competency factors for facial cartilage and tooth specification.

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Public Summary:

Scientific Abstract:

Facial form depends on the precise positioning of cartilage, bone, and tooth fields in the embryonic pharyngeal arches. How complex signaling information is integrated to specify these cell types remains a mystery. We find that modular expression of Forkhead domain transcription factors (Fox proteins) in the zebrafish face arises through integration of Hh, Fgf, Bmp, Edn1 and Jagged-Notch pathways. Whereas loss of C-class Fox proteins results in reduced upper facial cartilages, loss of F-class Fox proteins results in distal jaw truncations and absent midline cartilages and teeth. We show that Fox proteins are required for Sox9a to promote chondrogenic gene expression. Fox proteins are sufficient in neural crest-derived cells for cartilage development, and neural crest-specific misexpression of Fox proteins expands the cartilage domain but inhibits bone. These results support a modular role for Fox proteins in establishing the competency of progenitors to form cartilage and teeth in the face.

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